REMARKS

The concurrently filed RCE Transmittal is noted. The present amendments constitute the necessary Submission for this RCE Transmittal. Moreover, in view of the filing of the RCE Transmittal, it is respectfully submitted that entry of the present amendments is a matter of right, notwithstanding Finality of the Office Action mailed August 8, 2007.

By the present amendments, Applicants are further amending their claims, so as to further clarify the definition of various aspects of the present invention. Specifically, Applicants are incorporating the subject matter of claim 2 into claim 1; and, in light thereof, Applicants are cancelling claim 2 without prejudice or disclaimer. In addition, Applicants are amending their claims in order to recite rhombohedral "crystal" structure and hexagonal "crystal" structure.

Moreover, Applicants are adding new claim 7 to the application. Claim 7, dependent on claim1, recites that the crystalline structure of the graphite powder has some rhombohedral crystal structure, but that such rhombohedral crystal structure is contained in the graphite powder in the fraction of equal to or less than 10% by weight of the crystalline structure.

Applicants' respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior art applied by the Examiner in rejecting claims in the Office Action mailed August 8, 2007, that is, the teachings of U.S. Patent No. 5,340,670 to Takami, et al., under the provisions of 35 USC 102 and 35 USC 103.

It is respectfully submitted that this reference as applied by the Examiner would have neither taught nor would have suggested such a non-aqueous secondary battery as in the present claims, having, inter alia, the recited negative

electrode, and wherein the negative electrode includes graphite powder having a particle size equal to or smaller than 100 μm, and having a crystalline structure wherein a fraction of rhombohedral crystal structure of the crystalline structure is equal to or less than 10% by weight, and wherein a fraction of hexagonal crystal structure is equal to or more than 90% by weight. See claim 1.

In addition, it is respectfully submitted that the applied reference would have neither disclosed nor would have suggested such non-aqueous secondary battery, in particular, a lithium non-aqueous secondary battery (see claim 4), as in the present claims, having features as discussed previously in connection with claim 1, and, moreover, wherein the graphite powder has been formed from a graphite powder, having the recited particle size, with a fraction of rhombohedral structure greater than 10% by weight, and which has been treated to form the graphite powder with the specified particle size and the specified fraction of rhombohedral crystal structure equal to or less than 10% by weight (see claim 3); and/or wherein the graphite powder has substantially completely the crystalline structure (see claim 6).

As will be shown in the following, it is respectfully submitted that the applied reference, Takami, et al., does not disclose, nor would have suggested, and does not recognize, the desirability of limiting fraction of rhombohedral crystal structure, of the crystalline structure of the graphite powder; and would have neither taught nor would have suggested the presently claimed invention, including wherein the graphite powder included in the negative electrode has a fraction of rhombohedral crystal structure equal to or less than 10% by weight. As discussed in the following, and as supported by Figs. 1 and 3 of U.S. Patent No. 5,554,462 to Flandrois, et al., a reference of record in the above-identified application, hexagonal and rhombohedral crystal structure as in the present invention is different from the hexagonal-net-plane

layers of Takami, et al.; and such hexagonal-net-plane-layers of Takami, et al. would have neither taught nor would have suggested the crystal structure recited in the present claims, and advantages thereof.

In addition, even assuming, arguendo, that the teachings of Takami, et al. would have established a prima facie case of obviousness, the evidence of record in the above-identified application, and in particular Table 1 on page 22 of Applicants' specification, shows unexpectedly better results achieved according to the present invention, further supporting unobviousness of the presently claimed subject matter.

The invention as claimed in the above-identified application is directed to a non-aqueous secondary battery using a negative electrode that has graphite as the active material, this graphite active material being made of graphite powder. The present invention has use, for example, in connection with a lithium battery, and provides such battery which can have a high energy density and a long life, and which has excellent intercalation capacity (that is, an increased capacity of the battery).

Carbon material has been proposed as negative electrode active material in place of lithium metal, in lithium batteries, in which charge and discharge reactions involving lithium ion intercalation into the carbon material and deintercalation from the carbon material occur. However, in previously proposed batteries (e.g., lithium secondary batteries) using carbon material as active material for the negative electrode, a large capacity cannot be obtained; and, moreover, preferable performances of rapid charging and discharging are not obtained. Note the paragraph bridging pages 2 and 3 of Applicants' specification.

Against this background, Applicants provide a non-aqueous secondary battery using a negative electrode with graphite active material, which active material has

good charging and discharging characteristics, while having a large capacity (large intercalation capacity). Applicants have found that by using, as the negative electrode active material, graphite powder having a crystal structure (e.g., a substantially complete crystal structure), with this crystal structure being at most 10% rhombohedral crystal structure, and at least 90% by weight hexagonal crystal structure, for the overall structure of the graphite powder; and, in particular, by limiting the amount of rhombohedral crystal structure of the graphite powder, various advantages are achieved. In particular, by reducing the amount of rhombohedral crystal structure, of the crystal structure of the graphite powder, and, e.g., increasing hexagonal crystal structure, intercalation capacity of the negative electrode is increased. That is, the number of storage sites for lithium in the negative electrode is increased.

Thus, as described in Applicants' specification, on pages 5-8 thereof, as negative electrode active material for lithium secondary batteries, graphite has been disclosed, but it is necessary to pulverize this graphite in order to provide the graphite with a particle size of 100μm or smaller, as in the present claims. However, lithium intercalation-deintercalation capacity of the various graphite powders formed in the pulverizing, was not sufficient, as described in the last two paragraphs on page 5 of Applicants' specification. In order to investigate the reason for the small capacity, crystalline structures were investigated, and it was apparent that there were two kinds of crystalline structure in the pulverized graphite. In investigating the crystalline structure, it was revealed that, in the powder having insufficient capacity, the graphite having rhombohedral crystal structure was contained in approximately 30% in all of the graphite pulverized equal to or less than 100 μm in particle

diameter. Note the last full paragraph on page 6 of Applicants' specification. See also the first paragraph on page 7 of Applicants' specification.

Having discovered this source of the problem (i.e., graphite powder having large amount of rhombohedral crystal structure), Applicants provide a solution thereto, wherein fraction of rhombohedral crystal structure of the graphite powder of the negative electrode is limited to at most 10% by weight, in the powder having particle size equal to or smaller than 100 μm, whereby intercalation-deintercalation reaction of lithium is improved, providing superior charging and discharging characteristics, including improved discharge capacity.

As to advantages achieved according to the present invention, attention is respectfully directed to Table 1 on page 22 of Applicants' specification. This evidence must be considered in determining patentability, in any consideration of obviousness. See In re DeBlauwe, 222 USPQ 191 (CAFC 1984). As can be seen, with a fraction of rhombohedral crystal structure less than 10% by weight, improved lithium intercalation and deintercalation capacity is achieved.

In the prior Amendment in the above-identified application, filed May 15, 2007, Applicants relied on evidence in their specification as showing unexpectedly better results achieved according to the present invention. The Examiner has not commented on such evidence in Applicants' specification, which evidence was of course timely submitted and relied upon by Applicants. Such failure by the Examiner to comment on the evidence in Applicants' disclosure is clearly improper. See Manual of Patent Examining Procedure (MPEP) 716.01(a). Upon proper consideration of this evidence, and noting Applicants' traverse of the anticipation rejection, in connection with all of the present claims, including claim 7, it is

respectfully submitted that this evidence further supports patentability of the presently claimed subject matter.

Aspects of the present invention focus on the crystal structure of the graphite powder of the active material of the negative electrode, requiring that crystal structure of the graphite powder active material of the negative electrode has rhombohedral crystal structure of at most 10% by weight and has hexagonal crystal structure of at least 90% by weight.

Takami, et al. discloses a negative electrode carbonaceous material suitable for a lithium secondary battery, as well as a battery using this negative electrode carbonaceous material. According to Takami, et al., the negative electrode contains a carbonaceous material which has an exothermic peak at 700° C or more when measured by a differential thermal analysis, and an intensity ratio P_{101}/P_{100} of a (101) diffraction peak P_{101} to a (100) diffraction peak P_{100} of a graphite structure obtained by X-ray diffraction analysis, of 0.7-2.2; and absorbs and desorbs lithium ions. See column 3, lines 1-8. Other negative electrodes disclosed in Takami, et al., are described at column 3, lines 16-25, 38-44, 56-60 and 66-68; as well in column 4, lines 9-13, 17 and 18.

Note also column 20, lines 25-56; column 21, lines 3-22; column 22, lines 1-19 and 37-62; and column 23, lines 10-21, for other disclosures in connection with negative electrodes of the secondary battery of Takami, et al. These disclosures all refer to the carbonaceous material having a graphite structure that exhibits a property of allowing reversible absorption and desorption of lithium ions to and from hexagonal-net-plane layers in the graphite structure. Takami, et al. discloses, e.g., in column 20, lines 53-56, that the carbonaceous material has a graphite structure which is developed to a proper degree and in which stacked hexagonal-net-plane

layers have appropriate displacements, twists and angles to one another. Note also, for example, example 1 in column 24 and particularly lines 23-29 thereof, disclosing that the carbonaceous material used was a graphitized carbon powder with an average particle size of 25 μm, which was distributed at a ratio of 90 vol.% within the range of 1-50 μm in a particle size distribution, and in which the ratio of particles with a particle size of 0.5 μm or less was 0 vol. % in the particle size distribution. Note also, inter alia, example 2 and the discussion in connection therewith at column 25, lines 20-26; and example 3 and the discussion in connection therewith at column 25, lines 52-59, describing particle size of the carbonaceous material.

Attention is particularly directed to column 7, lines 29-40, of Takami, et al., emphasizing that the carbonaceous material having the recited intensity ratio has appropriate displacements, twists and angles of the hexagonal-net-plane layers so that lithium ions diffuse more easily between the hexagonal-net-plane layers; and note also column 14, lines 21-39, disclosing that the carbonaceous material has a mean length La of a crystallite in the a-axis direction of graphite structure. This patent again refers to crystallite structure, e.g., at column 22, lines 37-62.

It is respectfully submitted that the graphite structure in stacked hexagonal-net-plane layers includes (but is not limited to) two kinds, one having "hexagonal crystal structure" and the other having "rhombohedral crystal structure". It is respectfully submitted that the "hexagonal crystal structure" of hexagonal-net-plane layers is shown in Fig. 1 of U.S. Patent No. 5,554,462 to Flandrois, et al., of record in the above-identified application (cited in the Information Disclosure Statement submitted upon originally filing the above-identified application), and the "rhombohedral crystal structure" is illustrated in Fig. 3 of Flandrois, et al. Thus, while, as is clear from Flandrois, et al., hexagonal-net-plane layers can be of at least

two kinds, based upon the stacked structure of the hexagonal-net-plane layers, Takami, et al. nowhere discloses specifically the stacked condition of the "hexagonal-net-plane layers" thereof; and, moreover, Takami, et al. discloses that such hexagonal-net plane layers in their stacked condition have appropriate displacements, twists and angles to one another. In other words, it is respectfully submitted that Takami, et al. is silent as to whether the hexagonal-net-plane layers are of "hexagonal crystal structure", "rhombohedral crystal structure", or a mixture thereof, or anything else, particularly in light of the described displacements, twists and angles in the structure of Takami, et al. Clearly, and contrary to the contention by the Examiner, it is respectfully submitted that Takami, et al. is silent as to the crystal structure of the hexagonal-net-plane layers thereof.

Thus, contrary to the contention by the Examiner, it is respectfully submitted that Takami, et al. does not disclose, nor would have suggested, and cannot be a complete crystalline structure, of specified hexagonal crystal structure and rhombohedral crystal structure as in present claim 1.

In contrast, according to the present invention, with regular displacement of the hexagonal-net-plane layers in the graphite structure, graphite powder of hexagonal crystal structure and rhombohedral crystal structure, in amounts thereof as in the present claims, and having advantages due thereto as discussed previously, is obtained.

It is respectfully submitted that the disclosure in Takami, et al., having, e.g., crystallites, and having hexagonal-net-plane layers with appropriate displacements, twists and angles, would have neither disclosed nor would have suggested the presently claimed structure, including the graphite powder having the crystal structure, with the recited particle size of the graphite powder, and with specified

rhombohedral and hexagonal crystal fractions of the crystal structure of the graphite powder, and advantages thereof, as described in the foregoing. As Takami, et al. does not ever mention rhombohedral crystal structure, it is not seen how Takami, et al. can "anticipate" the presently claimed subject matter, including maximum amount of rhombohedral structure.

The contention by the Examiner in Item 2, on page 3 of the Office Action mailed August 8, 2007, that with the language in present claim 1 of less than 10% by weight for the amount of the graphite powder of a rhombohedral structure, a reference that does not mention any amount of rhombohedral structure would meet this recitation, is noted. However, attention is respectfully directed to new claim 7, reciting that the crystalline structure of the graphite powder has some rhombohedral crystal structure. In any event, it is respectfully submitted that Takami, et al. does not indicate the crystal structure of the graphite powder thereof, and would not have taught or suggested the crystal structure recited in claim 1, including, inter alia, amount of rhombohedral crystal structure and of hexagonal crystal structure.

The further contention by the Examiner that Takami, et al. "sets forth no specific amount of graphite powder of a rhombohedral structure", is noted. It is respectfully submitted that Takami, et al. sets forth no specific amount of graphite powder of a rhombohedral crystal structure in that it does not recognize the importance of limiting amount of rhombohedral crystal structure. As is clear from Applicants' original disclosure, in pulverizing the graphite to form powder of particle size as in the present claims, relatively large amount of rhombohedral crystal structure would be formed. It is respectfully submitted that the Takami, et al. does not recognize, nor would have disclosed or suggested, problems arising in connection with the relatively large amounts of rhombohedral crystal structure in

graphite powder of relatively small particle size. Moreover, it is further respectfully submitted that Takami, et al. would have neither taught nor would have suggested avoiding such problems, through use of graphite powder with limited amount of rhombohedral crystal structure, i.e., equal to or less than 10% by weight of the crystalline structure of the graphite powder.

It is respectfully submitted that the fact that Takami, et al. does not refer to rhombohedral crystal structure does not mean that the material thereof does not contain rhombohedral crystal structure; rather, it is respectfully submitted that this shows that Takami, et al. did not recognize adverse effects thereof.

The contention by the Examiner in the last three lines of the first full paragraph on page 3 of the Office Action mailed August 8, 2007 is again noted. It is respectfully submitted that even assuming, arguendo, that Takami, et al. does not specifically mention an amount of rhombohedral crystal structure, this does not mean that this reference teaches a zero amount of rhombohedral crystal structure, as alleged by the Examiner. In any event, attention is again directed to claim 1, now reciting that the graphite powder has a fraction of hexagonal crystal structure equal to or greater than 90%; and note also claim 7, reciting that the graphite powder has some rhombohedral crystal structure.

The contention by the Examiner that, at the very most, the negative electrode of Takami, et al. would include no more than 3% rhombohedral structure, set forth in the sentence bridging pages 3 and 4 of the Office Action mailed August 8, 2007, is noted. Such statement by the Examiner is without any evidence (e.g., a publication) or reasoning in support thereof; and, moreover, it is respectfully submitted that such contention by the Examiner is contrary to the reasoning in Applicants' original

disclosure, including increased amount of rhombohedral crystal structure in pulverizing the graphite powder to provide a particle size as in the present claims.

The provisional obviousness-type double patenting rejections set forth in Items 4 and 5 on page 5 of the Office Action mailed August 8, 2007, are noted. As any active application upon which the obviousness-type double patenting rejections are based, and the present application, are under active prosecution including amendment of claims, it is respectfully requested that any requirement in connection with filing a Terminal Disclaimer be held in abeyance until such time as claims are finalized.

In any event, it is respectfully submitted that the claimed subject matter in any of the applications referenced in these Items 4 and 5, still active,, upon which the obviousness-type double patenting rejections are based, do not focus on both minimum hexagonal crystal and maximum rhombohedral crystal structure in the graphite powder having a particle size of at most 100 μm, and advantages achieved thereby, as discussed in the foregoing. The presently claimed subject matter, directed to the secondary battery, defines a separate patentable invention from claims defining the electrodes, claims reciting hexagonal structure only, and claims reciting at most 20% rhombohedral structure (the present claims reciting at most 10%).

In view of the foregoing comments and amendments, and further in view of the concurrently filed RCE Transmittal, entry of the present amendments, and reconsideration and allowance of all claims presently in the above-identified application, are respectfully requested.

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Account No. 01-2135 (case No. 503.34465CV6), and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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